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Fluorination of single-wall carbon nanotubes

Mickelson ET, Huffman CB, Rinzler AG, Smalley RE, Hauge RH, Margrave JL

CHEMICAL PHYSICS LETTERS

296 (1-2): 188-194 OCT 30 1998

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Explanation**Abstract:**

Purified single-wall carbon nanotubes (SWNTs) were fluorinated at several different temperatures. Product stoichiometries were determined and electron microscopy was used to verify whether or not the fluorination was destructive of the tubes. SWNTs fluorinated at three different temperatures were then defluorinated using hydrazine. Raman spectroscopy and resistance measurements were utilized to verify whether or not the products of the defluorination were in fact SWNTs. It has been determined that the bulk of the SWNTs survive the fluorination process at temperatures up to 325 degrees C and that hydrazine can be employed as an effective defluorinating agent to regenerate the unfluorinated starting material. (C) 1998 Elsevier Science B.V. All rights reserved.

KeyWords Plus:

RAMAN-SCATTERING, DIAMETER

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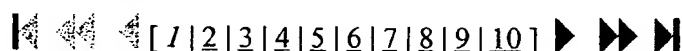
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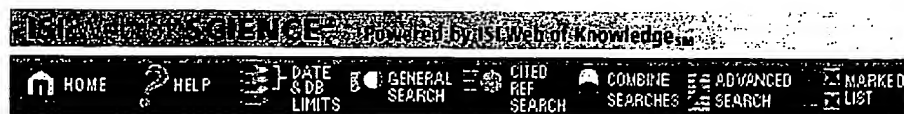
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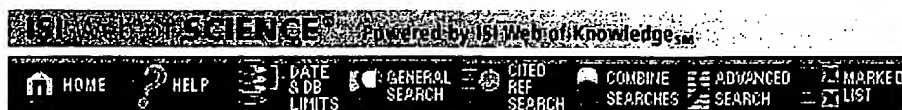
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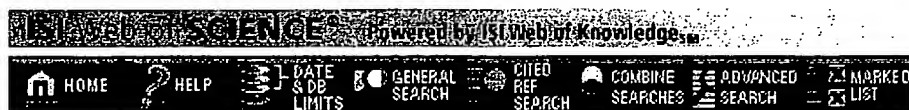
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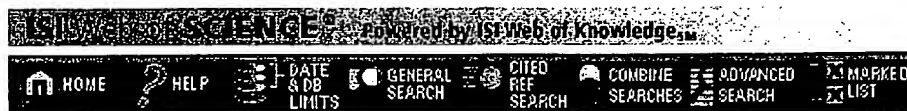
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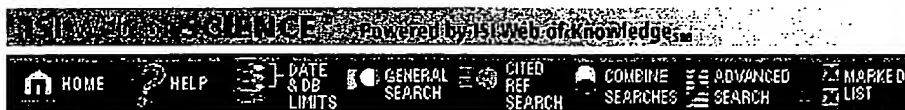
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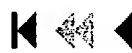
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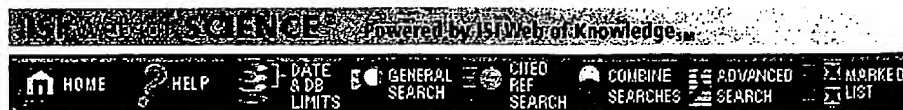
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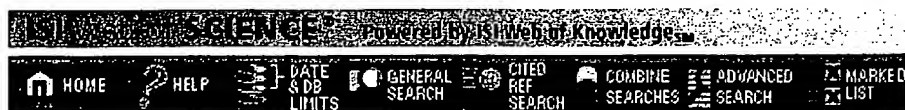
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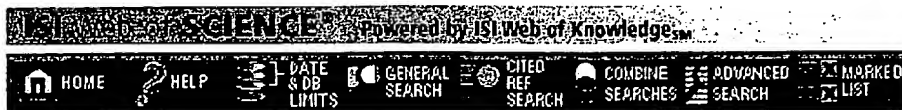
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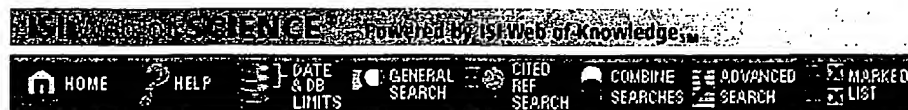
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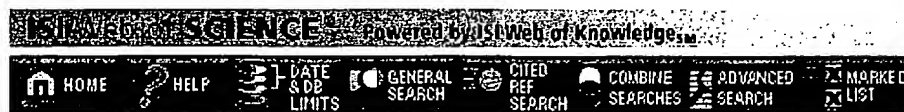
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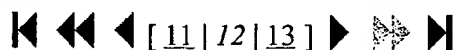
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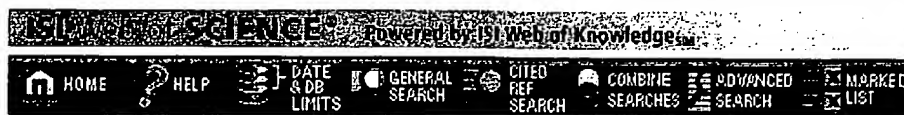
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Abstract:

Highly purified single-wall carbon nanotubes (SWNTs) were fluorinated to form "fluorotubes", which were then solvated as individual tubes in various alcohol solvents via ultrasonication. The solvation of individual fluorotubes was verified by dispersing the tubes on a mica substrate and examining them with atomic force microscopy (AFM). Elemental analysis of the tubes reveals that light sonication in alcohol solvents does not remove significant amounts of the fluorine. While these solutions are metastable, they will persist long enough (over a week) to permit solution-phase chemistry to be carried out on the fluorotubes. For example, the solvated fluorotubes can be precipitated out of solution with hydrazine to yield normal, unfluorinated SWNTs, or they can be reacted with sodium methoxide to yield what are apparently methoxylated SWNTs. These reaction products have been examined with elemental analysis and a variety of spectroscopies and microscopies.

KeyWords Plus:

RAMAN-SCATTERING, DIAMETER, PURIFICATION, ROPES

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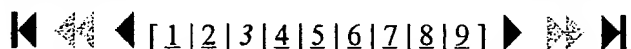
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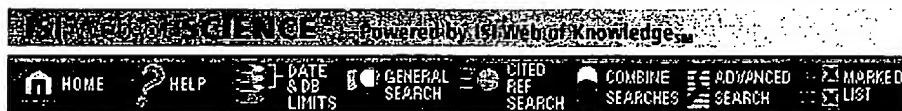
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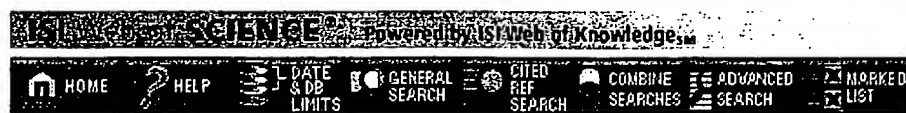
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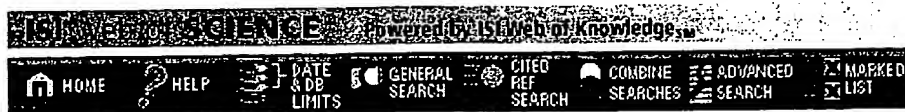
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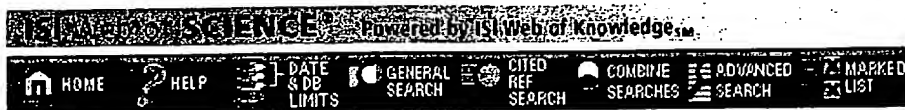
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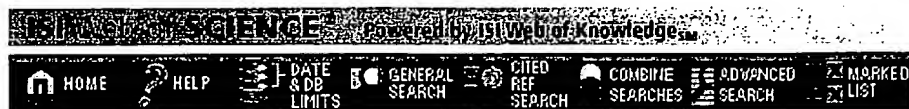
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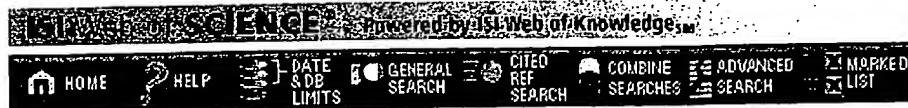
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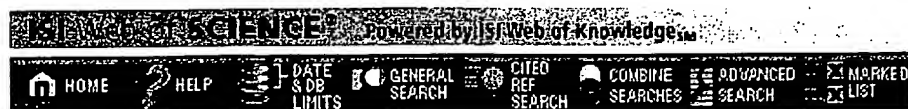
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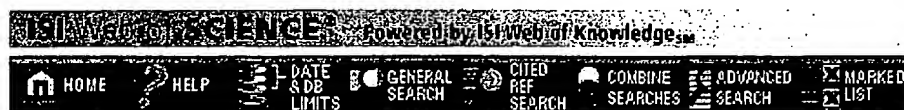
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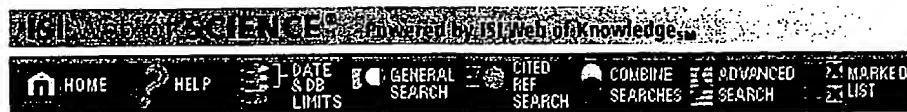
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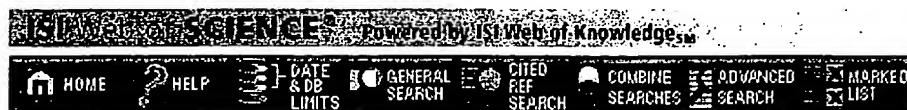
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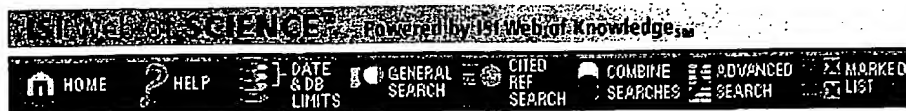
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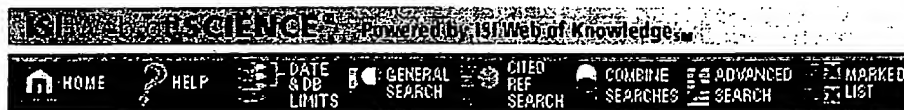
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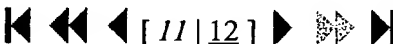
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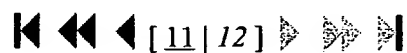
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